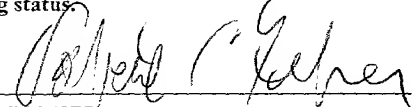


518 Rec'd PCT/PL 28 AUG 2001

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/914479		INTERNATIONAL APPLICATION NO. PCT/SE00/00416		ATTORNEY'S DOCKET NUMBER P/137-243	
17. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				CALCULATIONS PTO USE ONLY 	
				\$1,000.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	12 - 20 =	0	X \$18.00	\$	
Independent claims	2 - 3 =	0	X \$80.00	\$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$1,000.00	
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$ 500.00	
SUBTOTAL =				\$ 500.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$ 500.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$ 40.00	
TOTAL FEES ENCLOSED =				\$ 540.00	
				Amount to be refunded: \$	
				charged: \$	
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>540.00</u> to cover the above fees is enclosed. Check No. 6222 b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>15-0700</u> . A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: OSTROLENK, FABER, GERB & SOFFEN, LLP 1180 Avenue of the Americas New York, NY 10036-8403 Tel: (212) 382 0700					
				 SIGNATURE Robert C. Faber NAME <u>24,322</u> REGISTRATION NUMBER	

P/137-243

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Hans EKHOLM

Date: August 28, 2001

Serial No.:

Group Art Unit:

Filed:

Examiner:

For: METHOD FOR MOUNTING A DRUM AS WELL AS A DRUM AND AN AXLE FOR
 A BRUSH ROLLER

Asst. Commissioner for Patents
 Washington, D.C. 20231

AMENDMENT/SUBMISSION

Prior to examination, please amend the application as follows.

FEE CALCULATION

Any additional fee required has been calculated as follows:

 X If checked, "Small Entity" status is claimed.

	NO. CLAIMS AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOR		EXTRA PRESENT		RATE	ADDIT. FEE
TOTAL	12	MINUS	20	* =	0	X	(\$9 SE or \$18)	\$
INDEP.	2	MINUS	3	** =	0	X	(\$40 SE or \$80)	\$
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM						X	(\$135 SE or \$270)	\$

* not less than 20 ** not less than 3

TOTAL \$ -----

If any additional payment is required, a check which includes the calculated fee of \$ _____
 (OFGS Check No. _____) is attached.

In the event the actual fee is greater than the payment submitted or is inadvertently not
 enclosed or if any additional fee during the prosecution of this application is not paid, the Patent
 Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

CONTINGENT EXTENSION REQUEST

If this communication is filed after the shortened statutory time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. § 1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. § 1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

AMENDMENTS

☒ If checked, amendment(s) to the specification and/or claims are submitted herewith.

1. ☐ If checked, an abstract is submitted as the last page of Appendix A.

2. Specification:

Please delete the paragraph(s)/section(s) beginning at page, and replace such paragraph(s)/section(s) pursuant to 37 C.F.R. § 1.121(b)(ii) with the "clean" version attached hereto as Appendix A. Entry is respectfully requested. A version with markings to show the changes made pursuant to 37 C.F.R. § 1.121(b)(iii) is attached hereto as Appendix B.

3. Claims:

Please cancel claims _____ without prejudice.

Please amend claims 5-7 and 9-12 pursuant to 37 C.F.R. § 1.121(c)(i) as set forth in the "clean" version attached hereto as Appendix A. Entry is respectfully requested. A version with markings to show the changes made pursuant to 37 C.F.R. § 1.121(c)(ii) is attached hereto as Appendix B.

☐ If checked, the optional complete set of "clean" claims pursuant to 37 C.F.R. § 1.121(c)(3) is attached hereto as Appendix C.

REMARKS/ARGUMENT

This Preliminary Amendment is being submitted to change the multiple dependent claims to single dependent claims in order to eliminate the improper multiple dependent claims and to reduce the government filing fee.

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail to Addressee (mail label # EL855845397US) in an envelope addressed to: Asst. Commissioner for Patents, Washington, D.C. 20231, on August 28, 2001:

Dorothy Jenkins

Name of Person Mailing Correspondence

Dorothy Jenkins
Signature

August 28, 2001

Date of Signature

RCF/jc

Respectfully submitted,

Robert C. Faber
Robert C. Faber

Registration No.: 24,322

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00526709.1

APPENDIX A
"CLEAN" VERSION OF EACH PARAGRAPH/SECTION/CLAIM
37 C.F.R. § 1.121(b)(ii) AND (c)(i)

CLAIMS (with indication of amended or new):

(Amended) 5. A drum as claimed in claim 3, **characterized** in that congruence exists between at least two of the segments (7.1, ... 7.4) comprising the drum (2).

(Amended) 6. A drum as claimed in claim 3, **characterized** in that the segments (7.1, ... 7.4) define an outer arc shape (28A).

(Amended) 7. A drum as claimed in claim 3, **characterized** in that each segment (7.1, ... 7.4), in cross section shows a first edge part (42) with a first shoulder (35) and a second edge part (43) with a second shoulder (36), the upper side (37) of the first shoulder (35) and the lower side (38) of the second shoulder (36) exhibiting a flat surface.

(Amended) 9. A drum as claimed in claim 3, **characterized** in that the segments (7.1, ... 7.4) consist of extruded aluminium sections (7.1, ... 7.4).

(Amended) 10. A drum as claimed in claim 3, **characterized** in that the number of segments (7.1, ... 7.4) in the drum (2) is an even number, e.g. 2, 4, 6 or 8.

(Amended) 11. A drum as claimed in claim 3, **characterized** in that the drum (2) per se consists of two or more, preferably four longish segments (7.1, ... 7.4), of identical length, of extruded sections (7.1, ... 7.4), each segment (7.1, ... 7.4) exhibiting an outer arc form (28A).

(Amended) 12. An axle (1) for a brush roller, **characterized** in that the axle (1) consists of a drum (2) as claimed in claim 3, which is arranged between two shaft ends (3, 4), each shaft end (3, 4) being connected to a torque-transmitting plate (50) arranged concentrically in relation to and connected to the end part (22) of the drum (2).

APPENDIX B
VERSION WITH MARKINGS TO SHOW CHANGES MADE
37 C.F.R. § 1.121(b)(iii) AND (c)(ii)

CLAIMS:

5. A drum as claimed in [any one of claims 3-4] claim 3, **characterized** in that congruence exists between at least two of the segments (7.1, ... 7.4) comprising the drum (2).
6. A drum as claimed in [any one of claims 3-5] claim 3, **characterized** in that the segments (7.1, ... 7.4) define an outer arc shape (28A).
7. A drum as claimed in [any one of claims 3-6] claim 3, **characterized** in that each segment (7.1, ... 7.4), in cross section shows a first edge part (42) with a first shoulder (35) and a second edge part (43) with a second shoulder (36), the upper side (37) of the first shoulder (35) and the lower side (38) of the second shoulder (36) exhibiting a flat surface.
9. A drum as claimed in [any one of claims 3-8] claim 3, **characterized** in that the segments (7.1, ... 7.4) consist of extruded aluminium sections (7.1, ... 7.4).
10. A drum as claimed in [any one of claims 3-9] claim 3, **characterized** in that the number of segments (7.1, ... 7.4) in the drum (2) is an even number, e.g. 2, 4, 6 or 8.
11. A drum as claimed in [any one of claims 3-10] claim 3, **characterized** in that the drum (2) per se consists of two or more, preferably four longish segments (7.1, ... 7.4), of identical length, of extruded sections (7.1, ... 7.4), each segment (7.1, ... 7.4) exhibiting an outer arc form (28A).
12. An axle (1) for a brush roller, **characterized** in that the axle (1) consists of a drum (2) as claimed in [any one of claims 3-11] claim 3, which is arranged between two shaft ends (3, 4), each shaft end (3, 4) being connected to a torque-transmitting plate (50) arranged concentrically in relation to and connected to the end part (22) of the drum (2).

2/pst

**METHOD FOR MOUNTING A DRUM AS WELL AS A DRUM AND AN AXLE
FOR A BRUSH ROLLER**

Technical field

- 5 The invention relates to a drum as axle in a brush roller. Brush rollers are used for cleaning large flat surfaces and also in industrial context for deburring, polishing or roughening surfaces or edges.

Background art

- 10 It is well known that axles for brush rollers, particularly brush rollers used in road cleaning machines, are difficult to manufacture. These brushes generally have a length of between 1.5 to 4 meter and a diameter of between 700 and 1800 mm. The brushes rotate at a speed of between 400 and 1000 r/m.

- 15 The traditional method of manufacturing the axle of a brush roller is to attach axial holders on a steel pipe or rod, at the periphery of the pipe. Various types of brush magazines are then fitted in these holders. These axial holders are generally made of extruded aluminium. Other components included in such a brush roller are various forms of key joints and spacers. The steel pipe and spacers are welded together with known precision. A large number of holes for attachment bolts must also be drilled and threaded in the steel pipe. This vast number of
20 components entails high storage costs for material as well as expensive machining costs.

- 25 Commercial alternatives available are to design the axle of the brush roller as a fully extruded aluminium section. One problem is that the die used for the extrusion is limited as to size so that only certain maximum diameters can be produced. Furthermore, these extruded aluminium sections are extremely heavy since the material is thick, and it is impossible to reduce their mass by inserting cavities. A considerable drawback when extruding aluminium sections is the banana shape the section acquires on the cooling bed. A section that is 4 meter in
30 length may have a curvature of 4 mm or more. This curvature entails extra work at the dynamic balancing.

It is also known through US 3,134,123 and US 3,862,463 to make the cylindrical axle of the brush roller in segments, which are joined together and anchored, to hub members situated centrally at the ends of the axle. The segments are in the form of thin-walled sections, which are not reinforced in axial direction, and the axle is therefore limited in both length and diameter. This method of constructing the axle of a brush roller does not permit the manufacture of long axles, e.g. 4 m, nor axles having large diameter, e.g. 1200 mm, because of the unbalance occurring at the revolution speeds involved. US 3,134,123 also indicates that the embodiment shown in figure 3 constitutes a self-supporting construction. However, this construction is extremely expensive since the dovetail joints of the sections cannot be manufactured without after-working, with the tolerances necessary if the joints are to be free from play. Furthermore, the dovetail form according to US 3,134,123 must have a certain play to enable one section to be axially inserted into another section, and this per se results in play in the construction.

Object of the invention

The object of the invention is to solve the problems mentioned above and to improve a drum in the axle of a brush roller so that the axle becomes simpler and less expensive to manufacture, as well as being lighter, which contributes to increased stability at the bearing housings of the axle.

Another object of the invention is to provide a drum for the axle of a brush roller which drum, under dynamic loading, behaves as a rigid cylinder.

A further object of the invention is to provide a drum for a brush roller with relatively large diameter and length, which can be produced from extruded aluminium sections and which, after assembly, performs entirely free from play and with a rigidity equivalent to a homogenous body, e.g. a cylinder.

Summary of the invention

The objects stated above are achieved and the drawbacks eliminated by means of the present invention as defined in the claims.

The method for assembling a drum according to the inventive concept is that the drum forms a part of an axle and that the axle constitutes a part of a brush roller. Characteristic of the assembly is that an axle consists of a drum on which an end plate with two shaft ends have been mounted.

- 5 The drum preferably has circular cross section. A plurality of axial, preferably U-shaped channels are arranged at the periphery of the drum. A normal axle has 16 channels but the number of channels may be either more or fewer. The drum is preferably made from four segments of extrude aluminium sections.

- 10 The number of segments is in no way limited to these four segments but may vary from two or more, e.g. 2, 4, 6 or 8. An even number of sections is preferable in order to achieve dynamic balance in the simplest manner at rotation. The segments exhibit an outer arc shape. Four segments, for instance, are fitted together to form a drum. Each segment has a first edge part with a first shoulder and a second edge part with a second shoulder.

- 15 Assembly of four segment sections to a drum is as follows:

- In a first step each segment is arranged so that the edge portion of the first shoulder and/or the edge portion of the second shoulder are in contact with the second or first contact surface, respectively, of an adjacent segment. This ensures that the drum will always have the same diameter. A space between the various segments may cause unbalance. The contact surfaces between the shoulders of the segments are flat so as to obtain the greatest possible contact area without having to machine the surfaces. Alternatively the contact surfaces of the shoulders may be provided with pins and recesses in order to a greater extent to take up tangential shear stress between the segments.

- 25 A variant of the shape of the segments is to arrange two adjacent segments with the lower side of the second shoulder of a first segment in contact with the upper side of the first shoulder of a second segment.

- This is done when the shoulders of the segments are at different levels, i.e. radial distance from the axis of rotation of the axle. An alternative embodiment
30 is the use of two differently shaped segments, alternate segments being identical,

i.e. the shoulders on alternate segments are at equal radial distance from the inner arc.

- Another factor is that each section is curved at the extrusion. By dividing the drum into segments, the curvature of the segments will be compensated and the drum becomes straight. At one and the same extrusion process each rod will be cooled in the same way and each will acquire similar defects.

- A second step entails drilling or drilling and threading through-holes in radial direction, e.g. through the first, outermost shoulder as a clearance hole and through the second, innermost shoulder as a threaded hole, in each segment.
- Two or more holes are drilled along the segments in each shoulder, at equal or different distances from each other.

- The third step entails passing an attachment element, a bolt or a screw and nut, through each hole. This screw joint ensures complete freedom from play, which is necessary if a brush roller 2.5 - 6.0 meter in length is to be balanced dynamically and then withstand a continuous speed of revolution of up to 1200 rpm.

When the drum is mounted on the axle, a circular plate with a concentrically arranged shaft end is fitted on the end portions of the drum. Congruence exists between every or every other segment incorporated in a drum. The advantage of having only one shape for the segments in the drum is to save costs.

- The segments incorporated in a drum exhibit the following characteristics:
- the segments consist of extruded aluminium sections;
 - a segment exhibits an outer arc form;
 - each aluminium section is provided on its upper side with two or more, preferably four, radially protruding beams;
 - a U-shaped channel is formed between two adjacent beams;
 - each segment has a first shoulder and a second shoulder.

In one embodiment the upper side of the first shoulder and the lower side of the second shoulder of a segment preferably have flat surfaces.

- The segments are also made double-walled, one or more cavities being formed in each segment. In a segment with two cavities, these cavities are separated by radially reinforced spacers extending axially along the entire length of the

segment. The U-shaped channels of the segment are also situated radially in relation to the imagined central axis of the drum.

Brief description of the drawings

- 5 One embodiment of the invention is shown schematically in the accompanying drawings in which
- Figure 1 shows an axle with its drum and two shaft ends,
- Figure 2 shows an end part of a drum including a number of brush magazines inserted into slots,
- 10 Figure 3 shows an embodiment of a brush magazine
- Figures 4 A-B show a segment
- Figure 5 shows a section from figure 3 through a join between two segments revealing hole and bolt.
- Figure 6 shows a view A-A in figure 1 of an end part of the axle of a brush
- 15 roller.

Description of the invention

Figure 1 illustrates an axle 1 seen from the front, built up of a drum 2 and two shaft ends 3, 4. Each shaft end 3, 4, possibly in the form of part of a spline joint, is mounted on a torque transmitting plate 50 which in turn covers the end part 22 of the drum 2. Two shaft ends 3, 4, each with a plate 50, together with a drum 2, constitute the axle 1 of a brush roller.

20

Figure 2 shows an end part of the drum 2, the drum 2 in this embodiment comprising four segments 7.1, 7.2, 7.3, 7.4. The drum 2 is formed by the four segments 7.1, 7.2, 7.3, 7.4 after assembly. The segments 7.1, 7.2, 7.3, 7.4 are produced from an extruded aluminium section. Each segment 7.1, 7.2, 7.3, 7.4 is provided on its upper side 8 with four radially protruding beams 9.1, 9.2, 9.3, 9.4. In order to reduce manufacturing costs, the segments 7.1, 7.2, 7.3, 7.4 are congruent with each other.

25

30 In a drum 2 assembled from four segments 7.1, 7.2, 7.3, 7.4 there are sixteen U-shaped channels 10.1 10.16, arranged so that a U-shaped channel

10.2 is produced between two adjacent beams 9.1, 9.2. Similarly, the channels 10.1, ... 10.16 are arranged between the adjacent beams 9.1, ...9.16. Rows of brush magazines 13 in which brushes are fitted, are shown in the U-shaped channels 10.8 ... 10.11. Eight circular, threaded holes 21.1, ... 21.8 intended for use
 5 when assembling the plate 50 with its shaft ends 3, 4 to the end part 22 of the drum 2 are also arranged axially in each segment, preferably in the area below a beam near the ends of the segment. The drum is arranged to rotate about its central axis 12.

Figure 3 shows an embodiment of a brush magazine 13 comprising a
 10 holder 14 for five brushes with card wire 15, pressed into a plastic holder 16.

Figures 4A and 4B show an individual segment 7.1 with its extruded aluminium section, seen from the end. When an aluminium section 7 is extruded through a die, all the holes in the die will give the aluminium section 7 an elongate shape. The pattern of holes in a die corresponds with the cross section of the section.
 15 tion. In order to reduce the cost at manufacture, as well as the weight, and to increase the rigidity of the section 7, the section is provided with a number of cavities 20.1 - 20.6, four of which are situated in the beams 9.1, ... 9.4, and two in the section 7. The two cavities 20.2, 20.4 in the section are formed by the section having double walls and the cavities being separated by radially reinforced spacers
 20 60 extending axially along the entire length of the segment. In this example there are two more holes - the two circular, threaded holes 21.1, 21.2 intended for use when assembling the plate 50 with its shaft ends 3, 4 to the end part 22 of the drum 2, see figure 1. Each beam 9.1 ... 9.4 in the segment 7.1 exhibits a first side part 25.1 and a second side part 25.2, each with a longitudinal slot 26.1, 26.2.
 25 Each slot 26.1, 26.2 in each beam 9.1, ... 9.4, is at the same distance from the central point 12 of the drum. The openings of the slots 26.1, 26.2 face the U-shaped channel 10.1 ... 10.16. The openings 11 of the U-shaped channels 10.1 ... 10.16 face away from the centre 12 of the drum 2.

The outwardly facing surfaces 27.1 ... 27.16 of the beams 9.1, 9.2 when
 30 the segments 7.1 ... 7.4 are assembled to a drum 2, are at a tangent to a circumscribed circle 28. Each segment 7.1, 7.2, 7.3, 7.4 has an outer arc shape 28A.

One segment 7.1 in this example shows an inwardly facing surface 29 which also has an arc shape. Both the circumscribed circle 28 and the inwardly facing arc-shaped surface 29 have the same radial centre 12. A first shoulder 35 is arranged on the section 7, tangentially outside the first beam 9.1, and a second shoulder 36 is arranged on the section tangentially outside the fourth beam 9.4. The surfaces of the upper side 37 of the first shoulder 35 and the lower side 38 of the second shoulder 36 are preferably flat but may also assume an arc shape with a common radius 39. The centre of the radius 39 is at the centre 12 of the drum. The width "b1 - b2", i.e. the distance from the inner corner b2 between the upper side 37 of the shoulder 35 and a first radial contact surface 40 on the first beam 9.1 to the outer corner b1 of the shoulder 35 is preferably equal to the width "b3-b4", i.e. the distance from the inner corner b3 between the lower side 38 of the second shoulder and a second radial contact surface 41 below the fourth beam 9.4 to the outer corner b4 of the shoulder 36.

The outside of the preferably upwardly directed part at the upper side 37 of the first shoulder 35 is thus designated a first contact surface 40. The outside of a preferably radially downwardly directed part at the lower side 38 of the shoulder 36 is correspondingly designated a second contact surface 41.

The first shoulder 35 is provided with a first edge part 42. This edge part 42 extends from the lower side 29 of the shoulder 35 to its upper side 37. The second shoulder 36 is provided with a second edge part 43 extending from the lower side 38 of the shoulder 36 to the upper side 44 of the shoulder 36.

Assembly of the drum 2 is performed as follows:

- a) four segments 7.1, 7.2, 7.3, 7.4, figures 4A, 4B, are arranged close to each other as shown in figure 2 in such a way that the upper side 37 of the first shoulder 35 of a segment 7.1, 7.2, 7.3, 7.4 is brought into contact with the lower side 38 of a second shoulder 36;
- b) the first shoulder 35 of each segment 7.1, 7.2, 7.3, 7.4 and its first edge part 42 are brought into contact with the second contact surface of adjacent segments 7.1, 7.2, 7.3, 7.4, see figure 2;

- c) the second shoulder 36 of each segment 7.1, 7.2, 7.3, 7.4 and its second edge part 43 are brought into contact with the first contact surface 40 of adjacent segments, see figure 2;
- d) an alternative to b) and c) is for either a first edge part 42 to be in contact with a second contact surface 41 or a second edge part 43 to be in contact with a first contact surface 40;
- e) holes 45, 46 are drilled and threaded in radial direction, figures 4A, 4B, through each first 35 and second shoulder 36.
- f) a plurality of holes 45, 46 are drilled at equal or different axial distance from each other;
- g) an attachment element 47, figure 5, bolt, is arranged through each hole 45, 46 in such a manner that a friction joint is obtained between the shoulders 35, 36 at the contact surface 37, 38.

Figure 5 shows a section through a joint in figure 2 between two adjacent segments 7.1, 7.2. The section shows that the segments have been assembled using a screw joint, the second shoulder 36 of one segment 7.1 having a through-hole radially aligned with a threaded hole through the first shoulder 35 of the second segment 7.2. An attachment 47 in the form of a bolt, i.e. a machine screw, is screwed through these holes. The flat contact surfaces 37, 38 are thus pressed against each other, see figure 2. The upper side 44 of the shoulder 36 is also flat in order to provide the best possible contact surface for the attachment element 47.

Figure 6 shows a view A-A in figure 1 with part of the plate 50 removed. The figure shows the end of the axle 1 with its shaft end 3 arranged concentrically with the plate 50. Holes 52.n are arranged at the periphery 51 of the plate 50, where $n=1, \dots, 8$, for a second attachment element 53 in the form of an axially fitted bolt. The distance between the holes 52.1 ... 52.8 corresponds to the distance between the threaded holes 21.n, where $n=1, \dots, 8$, at the end part 22 of the drum 2.

Assembly of the plates 50 with their shaft ends 3, 4 to the drum 2 is performed as follows:

- a) a shaft end 3, 4 and its torque-transmitting plate 50 is arranged at each end part 22 of the drum 2;
- b) the shaft ends 3, 4 with plate 50 are arranged concentric with the end part 22 of the drum 2;
- 5 c) the attachment element 53 is screwed through the holes 52.1, ... 52.8 in each plate 50 and into the holes 21.1, ... 21.8 in the end part 22 of the drum 2.

The invention is not limited to the example described but can be used in all drums built up of segments to be used as part of an axle where each segment is in the form of an extruded section and where each segment has two shoulders
10 that are united with an attachment element. The invention is not limited to a certain number of segments but applies to all segments amounting to two or more. Neither is the invention in its widest scope limited to the drum assuming the shape of a cylinder. It may also assume the shape of an equilateral polygon.

CLAIMS

1. A method for assembling a drum (2) built up of segments (7.1, ... 7.4) forming part of an axle (1) for a brush roller, **characterized** in
 - 5 a) that each segment (7.1, ... 7.4) is brought into alignment by the edge portion (42, 43, respectively) of a first shoulder (35) and/or a second shoulder (36) being brought into contact with the second (41) or first (40) contact surface of an adjacent segment (7.1, ... 7.4);
 - b) that through-holes (45, 46) are drilled in radial direction through a first (35) and
 - 10 a second shoulder (36) in each segment (7.1, ... 7.4), one of said holes also being threaded;
 - c) that two (45, 46) or more holes (45, 46) are drilled in axial direction in each shoulder at equal or different distances from each other;
 - d) that an attachment element (47) is arranged at each hole (45, 46).
- 15 2. A method as claimed in claim 1, **characterized** in that a plate (50) with a shaft end (3, 4) is arranged at each end (22) of the drum (2).
3. A drum (2) for a brush roller, said drum (2) being built up of at least two
 - 20 segments (7.1, ... 7.4), each of which is provided at its upper side (8) with two or more, preferably four, protruding beams (9.1, ... 9.4), a U-shaped channel (10.2) being arranged between two adjacent beams (9.1, 9.2), and the drum (2) being arranged to rotate about its axis (12) by means of torque-transmitting means (50) connected to the drum (2), **characterized** in that each segment (7.1, ... 7.4) in the
 - 25 drum (2) is constructed with double walls with a rigidity sufficient for the assembled segments (7.1, ... 7.4) to form a fully self-supporting drum (2).
4. A drum as claimed in claim 3, **characterized** in that each segment (7.1, ... 7.4) is constructed with reinforcing spacers (60) between the double walls.

30

5. A drum as claimed in any one of claims 3-4, **characterized** in that congruence exists between at least two of the segments (7.1, ... 7.4) comprising the drum (2).

5 6. A drum as claimed in any one of claims 3-5, **characterized** in that the segments (7.1, ... 7.4) define an outer arc shape (28A).

7. A drum as claimed in any one of claims 3-6, **characterized** in that each segment (7.1, ... 7.4), in cross section, shows a first edge part (42) with a first
10 shoulder (35) and a second edge part (43) with a second shoulder (36), the upper side (37) of the first shoulder (35) and the lower side (38) of the second shoulder (36) exhibiting a flat surface.

8. A drum as claimed in claim 7, **characterized** in that between two adjacent
15 segments (7.1, 7.2), the flat surface of the lower side (38) of the second shoulder (36) of a first segment (7.1) is in contact with the flat surface of the upper side (37) of the first shoulder (35) of a second segment (7.2).

9. A drum as claimed in any one of claims 3-8, **characterized** in that the
20 segments (7.1, ... 7.4) consist of extruded aluminium sections (7.1, ... 7.4).

10. A drum as claimed in any one of claims 3-9, **characterized** in that the number of segments (7.1, ... 7.4) in the drum (2) is an even number, e.g. 2, 4, 6 or
8.

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11. A drum as claimed in any one of claims 3-10, **characterized** in that the drum (2) per se consists of two or more, preferably four longish segments (7.1, ... 7.4), of identical length, of extruded sections (7.1, ... 7.4), each segment (7.1, ... 7.4) exhibiting an outer arc form (28A).

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12. An axle (1) for a brush roller, **characterized** in that the axle (1) consists of a drum (2) as claimed in any one of claims 3-11, which is arranged between two shaft ends (3, 4), each shaft end (3, 4) being connected to a torque-transmitting plate (50) arranged concentrically in relation to and connected to the end part (22) of the drum (2).
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ABSTRACT

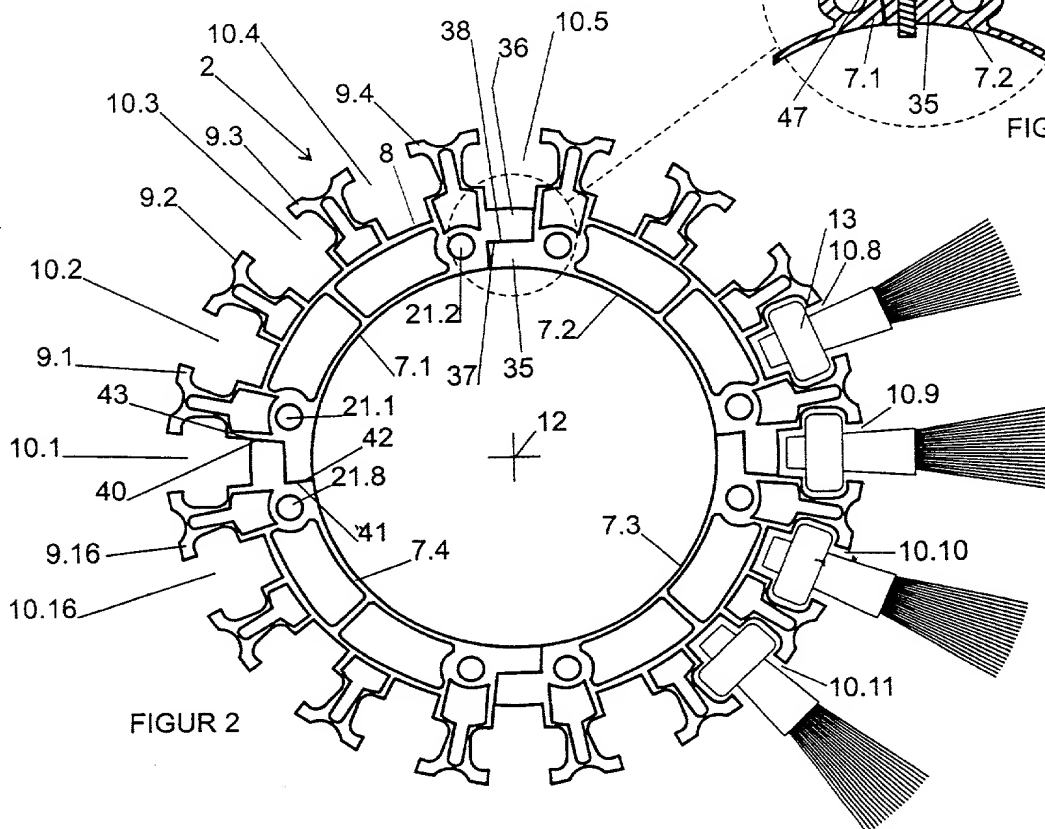
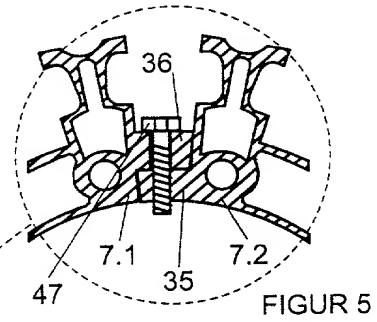
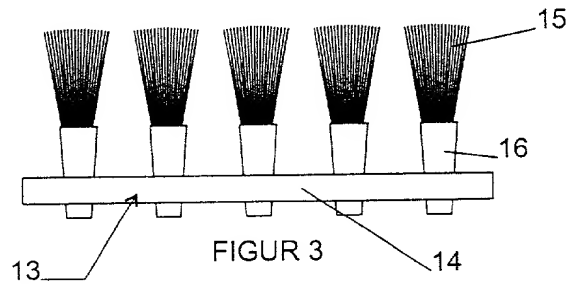
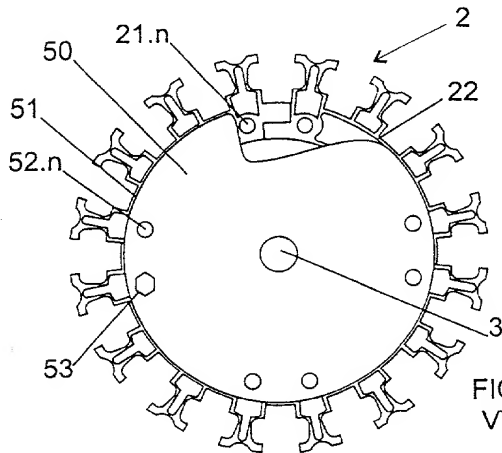
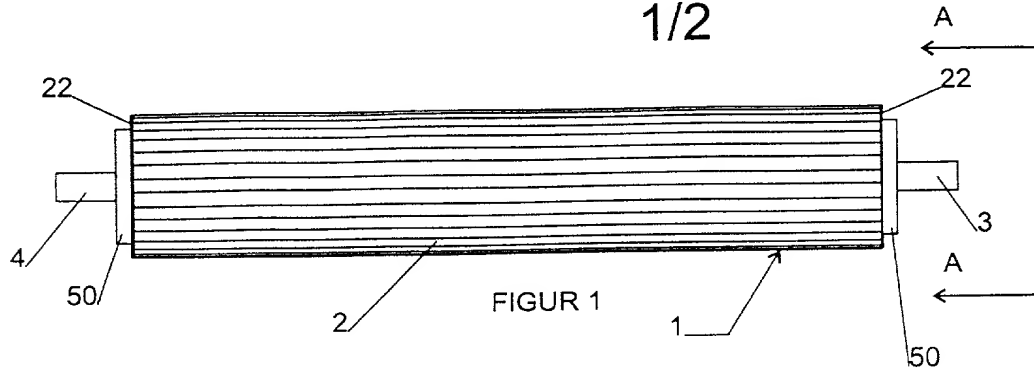
A method for assembling a drum (2) built up of segments and forming part of the axle (1) for a brush roller wherein;

- 5 a) each segment (7.1, ... 7.4) is brought into alignment by the edge portion (42, 43, respectively) of a first shoulder (35) and/or a second shoulder (36) being brought into contact with the second (41) or first (40) contact surface of an adjacent segment (7.1, ... 7.4);
- b) through-holes (45, 46) are drilled in radial direction through a first (35) and a
10 second shoulder (36) in each segment (7.1, ... 7.4), one of said holes also being threaded;
- c) two (45, 46) or more holes (45, 46) are drilled in axial direction in each shoulder at equal or different distances from each other;
- d) an attachment element (47) is arranged at each hole (45, 46).

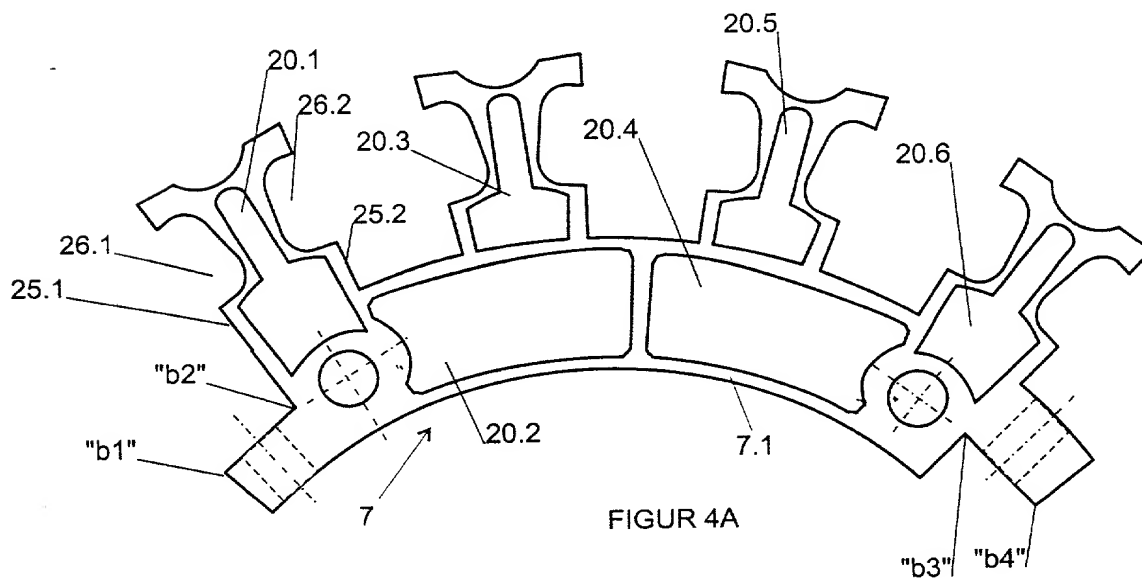
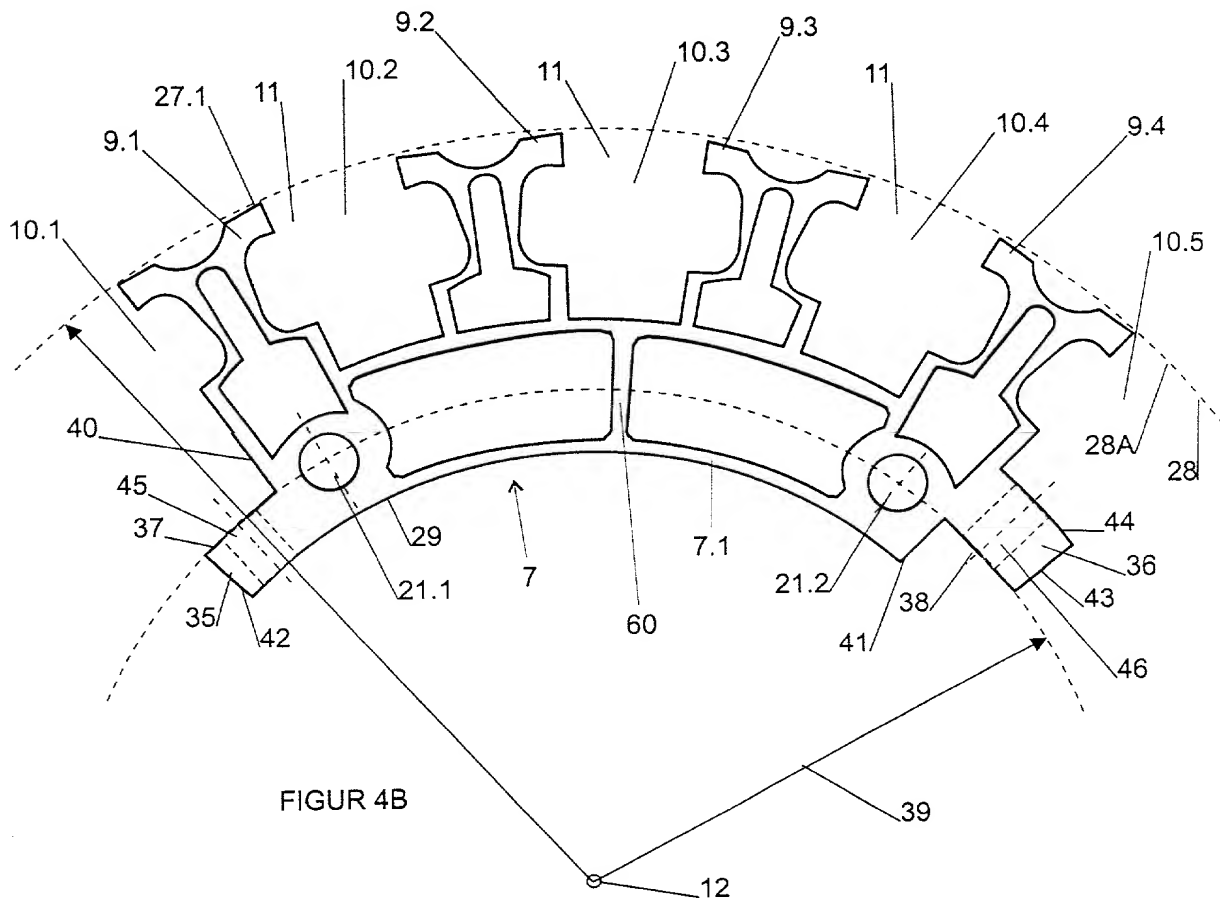
- 15 The invention also relates to a drum (2) for a brush roller, said drum (2) being built up of at least two segments (7.1, ... 7.4), each of which is provided at its upper side (8) with two or more, preferably four, protruding beams (9.1, ... 9.4), a U-shaped channel (10.2) being arranged between two adjacent beams (9.1, 9.2), and the drum (2) being arranged to rotate about its axis (12) by means of
20 torque-transmitting means (50) connected to the drum (2), each segment (7.1, ... 7.4) in the drum (2) being constructed with double walls with a rigidity sufficient for the assembled segments (7.1, ... 7.4) to form a fully self-supporting drum (2).




- The invention also relates to an axle (1) for a brush roller, the axle (1) consisting of a drum (2) as described above, which is arranged between two shaft
25 ends (3, 4), each shaft end (3, 5) being connected to a torque-transmitting plate (50) arranged concentrically in relation to and connected to the end part (22) of the drum (2).

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UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION		OFGS FILE NO. P/137-243																																																								
<p>As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named) of the subject matter which is claimed and for which a patent is sought on the invention entitled:</p> <p>METHOD FOR MOUNTING A DRUM AS WELL AS A DRUM AND AN AXLE FOR A BRUSH ROLLER</p> <p>the specification of which is attached hereto, unless the following box is checked:</p> <p><input checked="" type="checkbox"/> was filed on <u>2 March 2000</u> as United States patent Application Number or PCT International patent application number <u>PCT/SE00/00416</u> and was amended on _____ (if any).</p> <p>I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.</p> <p>I acknowledge the duty to disclose all information known to be material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.</p> <p>I hereby claim priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate or United States provisional application(s) listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:</p> <p>Prior Foreign or Provisional Application(s)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">COUNTRY</th> <th style="width: 25%;">APPLICATION NUMBER</th> <th style="width: 25%;">DATE OF FILING (day, month, year)</th> <th style="width: 25%;">PRIORITY CLAIMED UNDER 35 U.S.C. 119</th> </tr> </thead> <tbody> <tr> <td>Sweden</td> <td>9900789-0</td> <td>04 March 1999</td> <td>YES <input checked="" type="checkbox"/> NO <input type="checkbox"/></td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td>YES <input type="checkbox"/> NO <input type="checkbox"/></td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td>YES <input type="checkbox"/> NO <input type="checkbox"/></td> </tr> </tbody> </table> <p>I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">UNITED STATES APPLICATION NUMBER</th> <th style="width: 33%;">DATE OF FILING (day, month, year)</th> <th style="width: 34%;">STATUS (patented, pending, abandoned)</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table> <p>I hereby appoint customer no. <u>2352</u> OSTROLENK, FABER, GERB & SOFFEN, LLP, and the members of the firm, Samuel H. Weiner - Reg. No. 18,510; Jerome M. Berliner - Reg. No. 18,653; Robert C. Faber - Reg. No. 24,322; Edward A. Meilman - Reg. No. 24,735; Stanley H. Lieberstein - Reg. No. 22,400; Steven I. Weisburd - Reg. No. 27,409; Max Moskowitz - Reg. No. 30,576; Stephen A. Soffen - Reg. No. 31,063; James A. Finder - Reg. No. 30,173; William O. Gray, III - Reg. No. 30,944; Louis C. Dujmich - Reg. No. 30,625 and Douglas A. Miro - Reg. No. 31,643, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO: OSTROLENK, FABER, GERB & SOFFEN, LLP 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 CUSTOMER NO. <u>2352</u></p> <p style="text-align: right;">DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 35%;">FULL NAME OF SOLE OR FIRST INVENTOR <u>Hans EKHOLM</u></td> <td style="width: 30%;">INVENTOR'S SIGNATURE </td> <td style="width: 35%;">DATE <u>30 July 2001</u></td> </tr> <tr> <td colspan="2">RESIDENCE (City and either State or Foreign Country) <u>Västerås, Sweden</u> SEX <u>SEX</u></td> <td>COUNTRY OF CITIZENSHIP <u>Sweden</u></td> </tr> <tr> <td colspan="3">POST OFFICE ADDRESS <u>Jakthundsgatan 103, S-722 46 VÄSTERÅS, Sweden</u></td> </tr> <tr> <td>FULL NAME OF SECOND JOINT INVENTOR (IF ANY)</td> <td>INVENTOR'S SIGNATURE</td> <td>DATE</td> </tr> <tr> <td colspan="2">RESIDENCE (City and either State or Foreign Country)</td> <td>COUNTRY OF CITIZENSHIP</td> </tr> <tr> <td colspan="3">POST OFFICE ADDRESS</td> </tr> <tr> <td>FULL NAME OF THIRD JOINT INVENTOR (IF ANY)</td> <td>INVENTOR'S SIGNATURE</td> <td>DATE</td> </tr> <tr> <td colspan="2">RESIDENCE (City and either State or Foreign Country)</td> <td>COUNTRY OF CITIZENSHIP</td> </tr> <tr> <td colspan="3">POST OFFICE ADDRESS</td> </tr> </table>				COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119	Sweden	9900789-0	04 March 1999	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>				YES <input type="checkbox"/> NO <input type="checkbox"/>				YES <input type="checkbox"/> NO <input type="checkbox"/>	UNITED STATES APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)										FULL NAME OF SOLE OR FIRST INVENTOR <u>Hans EKHOLM</u>	INVENTOR'S SIGNATURE 	DATE <u>30 July 2001</u>	RESIDENCE (City and either State or Foreign Country) <u>Västerås, Sweden</u> SEX <u>SEX</u>		COUNTRY OF CITIZENSHIP <u>Sweden</u>	POST OFFICE ADDRESS <u>Jakthundsgatan 103, S-722 46 VÄSTERÅS, Sweden</u>			FULL NAME OF SECOND JOINT INVENTOR (IF ANY)	INVENTOR'S SIGNATURE	DATE	RESIDENCE (City and either State or Foreign Country)		COUNTRY OF CITIZENSHIP	POST OFFICE ADDRESS			FULL NAME OF THIRD JOINT INVENTOR (IF ANY)	INVENTOR'S SIGNATURE	DATE	RESIDENCE (City and either State or Foreign Country)		COUNTRY OF CITIZENSHIP	POST OFFICE ADDRESS		
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